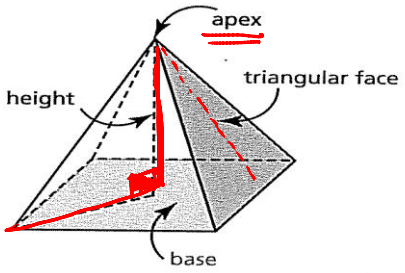
Name: _____ *Date:* _____

Math 10F&PC Chapter 1 Measurement

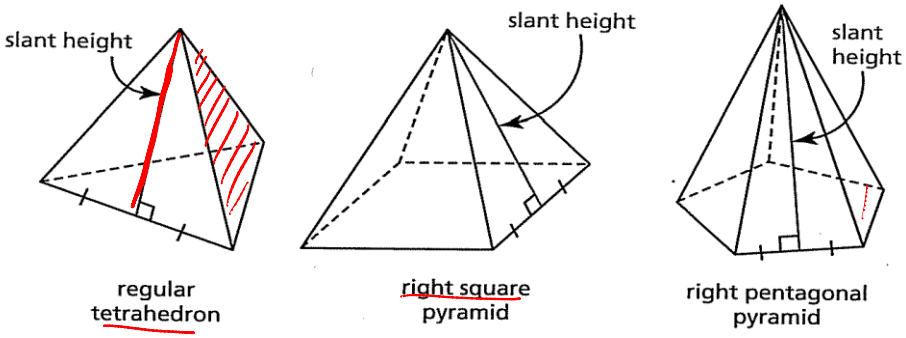
1.4 Surface Areas of Right Pyramids and Right Cones

Focus: Solve problems involving the surface areas of right pyramids and right cones

A right pyramid is a 3-dimensional shape that has triangular faces and a base that is a polygon. The shape of the polygon determines the name of the pyramid. The triangular faces meet at a point called the apex. The height of the pyramid is the ~~___~~ cular distance from the apex to the centre of the base.

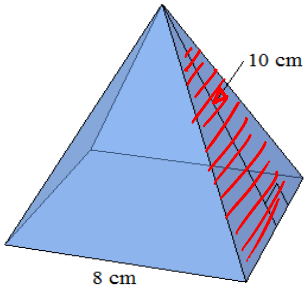


When the base of a right pyramid is a regular polygon, the triangular faces are congruent. Then the slant height of the right pyramid is the height of a triangular face.



The surface Area of a right pyramid is the sum of the areas of the triangular faces and the base.

***Example 1*:** Given the following right square pyramid, find the surface area.



base :-

$A = L \cdot W = s^2$

$= 8^2$

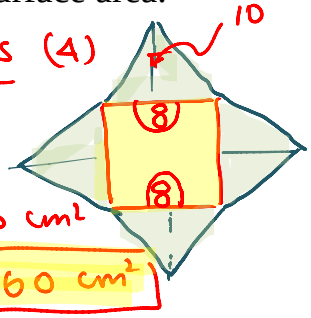
$= 64 \text{ cm}^2$

triangular faces (4)

$A = \frac{b \cdot h}{2}$

$= \frac{8 \times 10}{2} = 40 \text{ cm}^2$

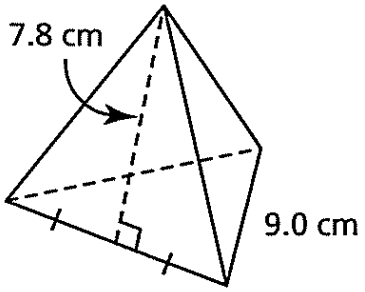
$= 40 \times 4 = 160 \text{ cm}^2$



$SA = A_{base} + A_{4\ triangle}$

$= 64 \text{ cm}^2 + 160 \text{ cm}^2 = 224 \text{ cm}^2$

***Example 2*:** Find the surface area of the following regular tetrahedron to the nearest square centimetre?



regular tetrahedron

All 4 faces are congruent

Areas are equal

(face) ⇒ 4

$A_{face} = \frac{b \cdot h}{2} = \frac{9 \times 7.8}{2} = 35.1$ (4)

Total SA = $4 \times 35.1 = \boxed{140.4\ cm^2}$

***Example 3*:** A right rectangular pyramid has base dimensions 8 ft. by 10 ft. and a height of 16 ft. Calculate the surface area of the pyramid to the nearest square foot.

$c^2 = a^2 + b^2$

$S_1^2 = 5^2 + 16^2$

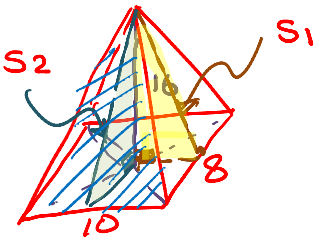
$S_1 = \sqrt{25+256} =$

$S_1 = \sqrt{281} = 16.76$

$S_2^2 = 4^2 + 16^2$

$S_2 = \sqrt{16+256}$

$= \sqrt{272} = 16.49$



base = — $A = L \cdot W$

$= 10 \times 8 = \boxed{80\ ft^2}$

face ① x2

$A = \left(\frac{b \cdot h}{2}\right) \times 2$

$= \left(\frac{10 \times 16.49}{2}\right) \times 2 = \boxed{164.9\ ft^2}$

face ② x2

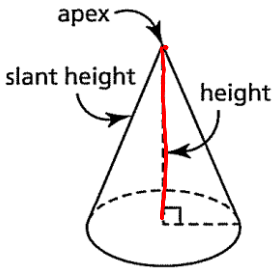
$A = \left(\frac{8 \times 16.76}{2}\right) 2$

$\boxed{A = 134.08\ ft^2}$

SA = 80 + 164.9 + 134.08

SA = 378.98 ≃ $\boxed{379\ ft^2}$

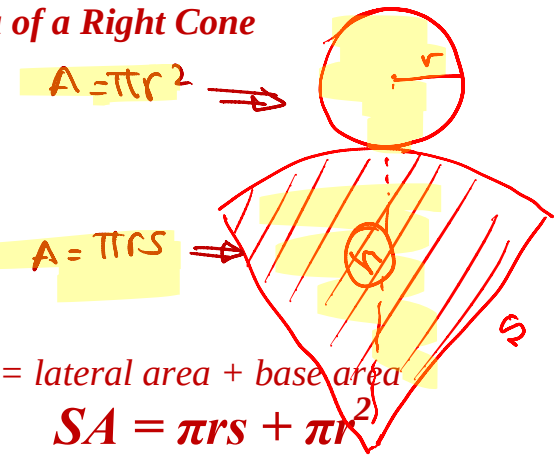
A right circular cone is a 3-dimensional object that has a circular base and a curved surface. The height of the cone is the perpendicular distance from the apex to the base. The slant height of the cone is the shortest distance on the curved surface between the apex and a point on the outside of the base.

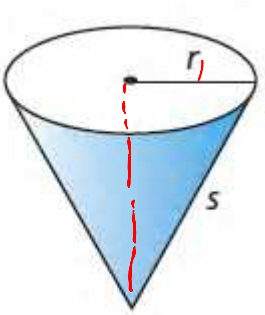


$A_O = \pi r^2$

$r = \frac{d}{2}$

Surface Area of a Right Cone





Surface area = lateral area + base area

$$SA = \pi rs + \pi r^2$$

***Example 4*:** A right cone has a base radius of 2 ft. and a height of 7 ft. Calculate the surface area of this cone to the nearest square foot.

$r = 2$ ft
$h = 7$ ft
$s = 7.28$ ft

$s^2 = h^2 + r^2$
$s = \sqrt{7^2 + 2^2} = 7.28$

$SA = \pi r^2 + \pi r s$
$= \pi(2)^2 + \pi(2)(7.28)$
$= 58.308 \simeq$ 58 ft²

***Example 5*:** The lateral area of a cone is 220 cm^2. The diameter of the cone is 10 cm. Determine the height of the cone to the nearest tenth of a centimetre.

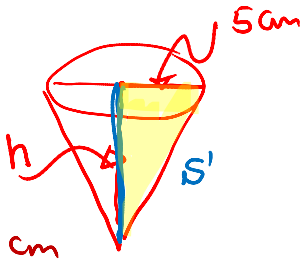
Lateral Area $= \pi rs = 220$ cm²

$d = 10$ cm
$h = ?$
$r = \frac{10}{2} = 5$ cm

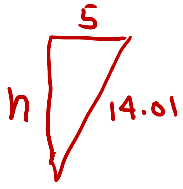
[1] Find s

$\pi rs = 220$ cm²

$s = \frac{220}{\pi r} = \frac{220}{(3.14)(5)} = 14.01$ cm



$h^2 = s'^2 - r^2$
$h = \sqrt{(14.01)^2 - (5)^2} = \sqrt{171.35} =$ 13.1 cm



Assignment: p. 34 #4–8,10,11,13.15–18